Allowance lists : insurance for fleet readiness.

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ALLOWANCE LIST: INSURANCE FOR FLEET READINESS

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A Thesis Submitted to the School of Government, Business and International Affairs of the George Washington University in Partial Fulfillment of the Requirements for the Degree of Master of Business Administration

April 26, 1965

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PREFACE

In 1956, I worked with a reserve fleet program that was designed to maintain ships of the reserve fleet in a state of supply readiness. This effort involved offloading the ships, identifying installed components and equipment, and stowing repair parts back on board ship in accordance with the existing allowance lists. This program was a forerunner of today's Supply Operations Assistance Program that is now applied to active ships during overhaul.

This opportunity--to see and to attempt to correct the complex allowance list problems--has spurred a continuing interest to observe the development of the allowance list to the Revised Individual Allowance List and then to the Coordinated Shipboard Allowance List. The writing of this paper has served as an opportunity to expand this interest into a study of the various programs created completely or in part to cope with the problems of the allowance lists as they exist today. It is encouraging to see the coming together of the various activities involved in the preparation and use of the allowance list into what can be an optimum reference point. For, what reference should be more comprehensive than the ship's allowance list?

CHAPTER I

ENVIRONMENT FOR NAVY REPAIR PARTS SUPPORT

Modern ships and their installed components have to be responsive to an environment characterized by an increasing requirement for speed and effective performance. This factor has put a premium on initial quality and range of all naval forces and their readiness for operations. At the same time, there is hardly anything that a piece of equipment, weapon, or weapons system is designed to accomplish that is not potentially limited to the extent that repair parts are available to maintain it.

The technical complexity and interdependence of parts in modern components and assemblies aboard today's ships have made immediate availability of essential parts a necessity for fleet readiness. These parts must be available when required, where required, and in the quantity needed. But the high cost of each supporting part, the frequent design changes, and the limited storage space aboard ship make any excess supply or inventory prohibitive.

To make the Fleet efficient and effective in a rapidly changing and complex world, the provision of repair parts must be accomplished with speed and accuracy. With the increased

speed and maneuverability of the modern fleet and its weapons systems, each ship has become responsible for a wider range of defense against attack capabilities. The likelihood of a "one shot, one hit" type of warfare places a greater reliance than ever on the need to be constantly prepared for any crisis.[1] Since a deficiency in any area could seriously jeopardize a significant element in the fleet's mission, the importance of having the necessary repair parts available to keep all systems working and effective is greatly magnified.

Navy logistics is the method by which such an environment is provided to sustain a ship wherever necessary to insure performance according to its designed purpose. The logistics element plays a greater role in today's military effort than it ever has in the past. Non-technical decisions cannot be afforded or relied upon in operating the specialized equipment aboard present-day ships. Yet, while timely logistics support is a necessity, fleet readiness must still exist within limited available resources and with certain restraints imposed by space, size, and weight of the part, cruise length, and budget. The vital need for timeliness and accuracy in supplying repair parts necessitates analyzing the present system against established priorities and concentrating resources according to these priorities. In this way the greatest results may be obtained from efforts. Making the best use of

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[1]Thomas W. McKnew, "Four-Ocean Navy in the Nuclear Age," National Geographic Magazine, Vol. 127, No. 2 (February, 1965), p. 156.

every possible resource and opportunity is the only way to turn today's system into one that is ready to meet the new challenges of tomorrow.[2]

One small but extremely important element of Navy logistics planning concerns the material carried on board each individual ship. This is called the ship's allowance of material, and its make-up, both in kind and quantity, is specified by the individual ship's allowance list. Allowance lists represent the first echelon of supply to fleet forces and, to a large extent, determine the duration of independent operations by a ship. It is the purpose of this paper to examine the objectives of the allowance list in the Navy's present system for supplying ships in commission with repair parts, to review claims of deficiencies in allowance lists, to evaluate the studies currently being made to solve these problems, and to make recommendations on the feasibility and practicality of the proposed solutions.[3]

The Growing Need for Supply Support

To understand the need for allowance lists and the problems involved in their make-up and use, it is pertinent first to examine briefly the history and development of the Navy's system for supplying repair parts.

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[2]Peter F. Drucker, Managing for Results, (New York: Harper and Row, 1964), pp. 140-141.

[3]This paper does not include the Fleet Ballistic Missile Weapon System Allowance List in its study.

The advancement of technology and the development of nautical excellence in such a modern and powerful navy as the U.S. Navy seems strange when we consider the fact that its ships have become less and less capable of operating independently of shore support. The great seafarers of the Fifteenth Century in their relatively tiny, fragile and meagerly equipped ships traveled the world over with little loss of operating capability. As ships gained more power, speed, and size, they became less and less capable of depending on the natural elements of their environment. The machine age introduced those elements that could provide the characteristics most sought after--speed (power) and size. The ships could afford the additional burdens imposed by this new source of power since the economic aspects were so great.

In the days of the sailing ship the vessel was provisioned to allow men to exist until they could put into any port for more rum, but with the machine age things became much more complicated. Fuel became the item upon which the number of days a ship was prepared to sail was based. And, of course, directly associated with this limiting factor was the need for repair parts. "A repair part is an integral manufactured and replaceable part (or assembly) of a piece of machinery or equipment, the part being furnished normally for replacing a part worn or damaged in service. The term 'spare part' is synonymous with the term 'repair part'."[4]

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[4]Department of the Navy, Bureau of Supplies and Accounts, Bureau of Supplies and Accounts Manual, Volume I, November 2, 1964, chapter 4, p. 3.

Ships today cannot expect to put into just any port for repair parts that are needed. As the machine age progressed, it became more and more necessary to project a favorable environment which would provide the ship with whatever it required, when required, on a planned basis.

Machinery powered and operated ships were initially supported according to each individual piece of machinery by the technical bureaus (including Bureau of Ships, Bureau of Yards and Docks, and Bureau of Ordnance) responsible for the various equipment. Frequently the individual judgment and experience of the personnel using the machinery was the sole basis for determining what repair parts would be on board. The needed repair parts that were not stowed on board were usually ordered directly from the manufacturer. In 1914, Pay Director Thomas H. Hicks of the Navy's Pay Corps (which became the Supply Corps in 1919) developed the Navy Standard Stock Catalog, the first attempt for identifying all items of material used by various bureaus.

Even at the time of World War II little recognition had been given to the distinction between the technical functions (research and development, design, determination of broad operating requirements, construction, inspection, and maintenance) and supply functions (cataloging, inventory control, procurement, storage, transportation, stores accounting, issue, and disposal). With the pressures of wartime conditions, each of the technical bureaus built up some elements

of its own separate supply system. These independent systems were all similar to the extent that repair parts were procured with the equipments and were provided to the ships in sets, designed to provide maintenance support for each individual equipment. Generally they were packaged in metal boxes that were stored as conveniently as possible to the relevant equipment.

The disadvantages of these separated supply systems became increasingly obvious in the experiences of World War II.[5] The ships had to use many different procedures to obtain items through the independent bureau supply systems. The more common items, such as roller bearings, were carried in large numbers by each one of the systems. The resultant duplication of inventories tied up funds and, more seriously, led to shortages of items in one system with excesses of the same item in others. The exchange of information on the availability of stock was almost nonexistent among the systems.

Under these independent systems of supply, technical talent was poorly utilized.[6] Technically qualified personnel were spending much time not only in designing but also in the management of supplying large quantities of small technical items and repair parts. As technological developments increased the number of parts and transactions involved, proper

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[5] Department of the Navy, Bureau of Supplies and Accounts, Supply Support of the Navy, NAVSANDA Publication 340, September 15, 1957, pp. 17-18.

[6] Ibid.

attention could no longer be given to both the development and the stock control and issue of the major end items of equipment. Similarly lacking was the opportunity to devote professional supply talent to the overall task of improving actual supply-type management.

Development of the Integrated Supply System

An evaluation of the defects that developed in the Navy's logistic support system during and after World War II led to the development of the "integrated" Navy Supply System, as approved by Secretary of the Navy James Forrestal on February 14, 1947. This system recognized the performance of the supply functions as being essentially the same regardless of the particular material area being considered. Therefore, management of the supply functions was centralized under one bureau, while technical functions remained the responsibility of the pertinent technical bureaus.

Under the new Supply System the control of repair parts, consumables, and small equipments were vested in "intelligence centers" made up of inventory control points.[7] Each inventory control point would control one broad category of material, such as ships parts, ordnance repair parts, electronic parts, aviation parts, or provisions of the Navy's total inventory. The inventory control point was directed to look to the parent technical bureau for guidance in technical

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[7] Ibid., pp. 18-22.

matters in a particular material area and to the Bureau of Supplies and Accounts for guidance relating to the performance of its supply management functions.

These inventory control points, or "supply demand control points," maintain a balance between the supply of and the demand for items in a particular assigned material area. Their primary objective is the control of the material and does not include storing or physically handling the material. The major functions of the supply demand control points involve the determination of requirements, the procurement of requirements, and the distribution of requirements to meet demand.[8] The inventory control points are also charged with numerous other functions, including preparation of item identifications and obtaining Federal Stock Numbers for new items and the preparation and revision of allowance lists and load lists for consuming ships, supply ships, and overseas bases. They determine excess stock, authorize or direct disposal, cannibalization, and repair action, develop standards for preservation and packaging of material, estimate storage space requirements, and have budgeting and financial management responsibilities in their commodity areas. Carrying out these varied responsibilities requires close contact with the mobile supply support system and overseas naval bases, as well as naval industrial activities, such as shipyards, ordnance plants, and air stations. The overall inventory control is

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[8]Department of Defense, Supply Management Reference Book, September, 1964, p. 25.

exercised through stock status and consumption reports received from stock points under their cognizance.

While the supply demand control points control the distribution of items, the actual distribution comes under a separate operational part of the Navy Supply System involving stock points and distribution points. The stock points receive, store, and issue items and also supply information to the inventory control points by reports of daily transactions or through quarterly summaries.

Changes in Shipboard Repair Parts Inventory Control

When the integrated Supply System went into effect, shipboard repair parts were being stocked in accordance with the requirements of the technical bureaus. Each bureau used a different medium for making its requirements known to the ship. These varying documents, known as "allowance lists," contained the technical bureaus' best estimates of the parts required to support a given equipment. Although the format differed for each technical bureau, generally the basic information provided was similar. Each major piece of equipment on the ship was identified by the model number and manufacturer with its component parts listed and cross referenced to detailed assembly plans. The assembly plans, describing the equipment's physical features, were provided separately in operating instruction books or in complete sets for major ship systems.

The allowance lists set forth the quantities of each repair part required to perform repairs that the technical bureaus considered within the ship's capabilities. In some cases repair parts were considered so vital to the operation of the ship that they were stowed aboard even if the actual installation or repair work could not be done without the assistance of a shipyard or a repair ship. Frequently an engineering "safety factor" of at least one hundred per cent was used to reduce the chance of running out of a technical item.[9] As greater quantities of more complex equipment was placed aboard ships, the space requirements for the larger or more numerous repair part boxes began to exceed the space available. Much equipment, especially electronic equipment, used identical parts and created as a result duplication of inventories. Moreover, the use of the manufacturer's part number for identification often restricted the amount of information available to determine interchangeability.

The World War II allowance list was a technical document assembled on an equipment basis according to the vessel class or type. This consolidated or "type C" allowance list was prepared by a designated shipyard for a particular vessel class and assigned to each ship in that class regardless of the variations in the make, model, or kind of equipment actually aboard the individual ship. As a result many items

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[9]Department of the Navy, Bureau of Supplies and Accounts, Supply Support of the Navy, NAVSANDA Publication 340, September 15, 1957, p. 29.

included in the allowance list did not pertain to the equipment installed on a particular ship. There were also equipments on board that were not covered by the allowance list. As equipment and installed components were replaced and removed, repair parts not pertaining to the new equipment remained aboard the ship. Following World War II when more than a thousand ships were inactivated to Reserve Fleets, complete offloading and screening of all repair parts aboard in conjunction with actual onboard equipment made it possible to gain new insight into the need for correcting these deficiencies.

Even after the improved identification system was introduced--the assignment of Standard Navy Stock Numbers to all repair part items--there was still very little reduction in the duplication of items aboard ship. Repair part boxes continued to be packed for a specific equipment, rather than for a specific ship. If the ship had a multiple installation of identical equipment it would receive one repair parts set for each unit. In addition, each ship continued to maintain several repair parts systems coinciding with the shore establishment organization. With repair parts under the custody of the division or department responsible for maintenance of the associated equipment, the department would decide the need for parts regardless of interchangeability with other departments.

To eliminate or reduce these areas of duplication, several approaches were initiated. Under the heading of Revised Individual Allowance List, a new allowance list was made up for each individual ship rather than for each ship type. Under the revised list no repair parts were included that did not meet the needs of the particular equipment aboard a specific ship.

Perhaps the most significant development at this time was the discarding of the repair part boxes in favor of centralized bin or drawer storage. The requirements determination base shifted from the individual unit to a grouping of like equipments. The Electronics Supply System, with its need for great duplication of items, its limited space, and its high cost, contributed to the origin of this development. The central storage of the common items gradually led to the consolidated bin storage of all repair parts in the ship. This was an outstanding means of improving availability, saving weight and space, simplifying inventory control procedures, and at the same time providing the ship with a better overall factor of safety in "insurance" items.[10]

The Bureau of Ships, in conjunction with the Bureau of Supplies and Accounts and the various Supply Demand Control Points, initiated a program in the latter part of 1954 to determine if a new method of preparing allowance lists could be developed utilizing the latest electronic data processing

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[10] Ibid., p. 30.

equipment. This program resulted in the development of the Shipboard Allowance List (SAL), a completely mechanized document. The Shipboard Allowance List was essentially a Revised Individual Allowance List in a new format. The SAL covered the same general areas of hull, mechanical and electrical components, repair parts, equipage and consumable supplies that a Revised Individual Allowance List covered.[11]

Under the Shipboard Allowance List all printed data was punched into electronic accounting machine cards, transferred to magnetic tape, and then processed automatically through a high-speed electronic data processing machine or computer. One of the most important benefits to be derived from this new mechanized allowance list was that for the first time repair parts, on a total shipboard basis, could be scientifically reduced by applying one of twenty-five reduction formulas to each part based on the technical requirements for that part. Thus, the interchangeability of parts could be determined automatically through the computer. When the ship's equipment list contained multiple units of the same equipment, the allowance of repair parts was reduced by providing a complete set of repair parts for the initial unit only and providing other complete sets for only a portion of the additional units. The assignment of these parts was based on the importance of the unit to the operability of the ship and the probability of more than one unit being disabled simultaneously.

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[11]Department of the Navy, Bureau of Supplies and Accounts, Material Management Branch, "The Computation of Onboard Repair Parts Under the Mechanized Shipboard Allowance List Program," unpublished report, 1960, pp. 2-3.

Yet, in spite of the efforts during the ten-year period following the inception of the integrated supply system, duplication still existed in the shipboard repair parts organization effort. In recognition of the continuing need for coordination, the Coordinated Shipboard Allowance List (COSAL) Program was established in December, 1956. The primary objectives of this program included:

1. Development of standard allowance list format. The various allowance list sections were to be published in standard format in order to increase their universal understandability and to allow their preparation and maintenance by mechanized processes.
2. Centralized storage of shipboard allowance list materials. All repair parts carried on each ship were now to be stowed in bins.
3. Consolidation of requirements. This consolidation of requirements of the various repair parts systems on board ship required the transfer of the allowance list publication from the technical bureaus to the Supply Demand Control Points, but left the determination of the requirements with the technical bureau.[12]

Because the effectiveness of the shipboard allowance list so basically influences the combat readiness of the ship, it has been a subject of great importance to the Navy in recent

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[12]Department of the Navy, Office of the Chief of Naval Operations, OPNAV Instruction 4441.4, December 20, 1956.

years. Applying scientific techniques to inventory control policy has gained wide attention, and research has been aimed at developing better stock level policies, thereby increasing the supply endurance of combatant ships. It was toward the accomplishment of this goal that the Coordinated Shipboard Allowance List Program was established.

The COSAL continues to serve today as the basic stocking authority at shipboard level, as the technical and supply document for inventory management afloat, and as a means for measuring a ship's supply readiness. Although the COSAL represents progress over earlier allowance lists, it is constantly undergoing changes to meet new requirements and to overcome certain deficiencies. To understand these needs and the attempts to meet them, it is necessary to examine the form of the COSAL and the criteria used in developing it.

CHAPTER II

COORDINATED SHIPBOARD ALLOWANCE LIST (COSAL)

Development of the COSAL

Under combat conditions the material carried by an individual ship may be its only assured source of supply. This vital first echelon of supply without augmentation from external sources is therefore a determining factor in the duration of a ship's independent operations.[13] Thus, the prime purpose for establishing the Coordinated Shipboard Allowance List Program in 1956 was to enhance this self-supporting capability of the Navy's operating forces.

In the overall plan to improve the material readiness of the fleet, the COSAL Program provided for a coordinated program of bin-drawer stowage, supply availabilities, and uniform, improved allowance lists. To the Bureau of Supplies and Accounts were assigned the following responsibilities:

1. Coordinate the efforts of allowance preparing activities.

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[13]Department of the Navy, Office of the Chief of Naval Operations, OPNAV Instruction 4441.12, August 27, 1964, p. 1.

2. Coordinate with the technical bureaus the standardization of format and improvement of the content of shipboard allowance lists.
3. Develop uniform procedures for collection and analysis of usage data.
4. Develop balanced support for various material categories.
5. Develop depth formulas for use when items have multiple application to various COSAL segments.[14]

In assuming these responsibilities one of the first steps taken by the Bureau of Supplies and Accounts was the development of an allowance list applicable to each individual ship yet standardized in format and content. A standard format was considered desirable to allow the preparation and maintenance of allowance lists by mechanized processes and to permit the mechanization of related records and reports. The resultant format of the COSAL was developed by the Bureau of Supplies and Accounts with the cooperation of the allowance preparing activities and the technical bureaus. The COSAL serves both as a technical document in that it describes and establishes mandatory quantities of onboard equipments, components, equipage, and supporting repair parts, and as a

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[14]Department of the Navy, Bureau of Supplies and Accounts, BUSANDA Instruction 4441.2B, April 25, 1963, pp. 1-2.

supply document in that it provides the basis for shipboard inventory management.[15]

The COSAL combines into one document the shipboard allowance for all installed and portable equipment, equipage, and directly supporting material. Excluded from the material in the Coordinated Shipboard Allowance List Program are ship's store stocks, resale clothing, bulk fuels, subsistence items, and expendable ordnance and repair parts for aircraft. Allowance requirements for nuclear weapons, guided missiles, and certain Fleet Ballistic Missile equipments are included in special supplements to the COSAL.

Ships are ordinarily required to carry a full allowance of the material authorized by the COSAL. They are not, however, permitted to exceed this allowance without the specific approval of the type commander or the pertinent technical bureau. The quantities allowed are calculated to provide each ship with the maximum amount of built-in endurance with consideration given to space, weight, and cost factors.

The various material category segments of the COSAL are published by the responsible supply demand control points under the joint direction of the cognizant technical bureau and the Bureau of Supplies and Accounts. The responsible supply demand control points are identified by cognizance

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[15]Department of the Navy, BUSANDA, Bureau of Supplies and Accounts Manual, Volume I, November 2, 1964, chapter 4, p. 31.

symbols as follows:[16]

Supply demand control points (SDCP)	Material cognizance symbols
Navy Ships Parts Control Center (SPCC)	S equipments H material 2H material 9G material P material KZ material
Navy Electronics Supply Office (ESO)	F equipments N material 2N material
Navy Aviation Supply Office (ASO)	R material for catapult and arresting gear
Navy Yards and Docks Supply Office	Y material 9Y material 9C material
Navy Ordnance Supply Office (OSO)	J equipments Z material A material

The allowance list segment for nuclear weapons material is prepared by the Ordnance Supply Office but is not identified by a cognizance symbol. After July 1, 1965, it is planned that the Ordnance Supply Office's inventory management responsibilities will be assumed by the Electronic Supply Office and Ships Parts Control Center.

The purpose for assigning these alphabetical symbols to certain categories of material was to provide a means for eliminating unnecessary duplications of parts, for identifying each item to its cognizant supply demand control point, and for coordinating the lists or segments into one document. All

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[16] Ibid., p. 33.

allowed items for a given cognizance of material appear in only one segment of the list. For example, all cognizance symbol "N" allowed items appear only in the electronics segment, although the requirement for an item may originate from an equipment in the ordnance segment, or in the hull, mechanical, and electrical segment. This process, which was first achieved with the SAL, permits the consolidation and reduction of allowance quantities of repair parts by electronic data processing machines in accordance with established mathematical techniques. It, in turn, leads to improving the endurance capability of the ship and to reducing the total allowance quantities of repair parts aboard.

Form and Content of the COSAL

The Coordinated Shipboard Allowance List is made up of four parts:

Introduction

Part I Index

Part II Allowance Parts List

Part III Stock Number Sequence List

The Introduction to the COSAL contains general instructions for its use and maintenance and specific instructions and information peculiar to the material category segment covered. It is divided into chapters developed by the Bureau of Supplies and Accounts and by the various preparing activities: Ships Parts Control Center, Electronics Supply Office,

Ordnance Supply Office, and Aviation Supply Office.[17]

Part I of the COSAL is the Equipment Index which briefly lists and describes the kinds and quantities of equipment, components, and equipage authorized to be aboard a specific ship. Items are listed in three sections of the Index. Section A lists material alphabetically by the name of the item. Section B lists the same items but in alphabetical sequence by the service application or function of the component or equipage. A third section summarizes current listings of allowance parts.[18]

Part II constitutes the technical section of the COSAL. An Allowance Parts List (APL) is provided for each equipment or equipage category listed in the COSAL Index. APLs are of two general types: Equipment APLs and Equipage Category Numbered APLs.

Equipment APLs are technical documents which describe an equipment or component and list both the required onboard repair parts and all other parts available in the supply system for support of the equipment.[19] Equipment APLs are intended to enable a ship or other activity to identify repair parts to a Federal Stock Number for requisitioning purposes.

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[17] Department of the Navy, Coordinated Shipboard Allowance List: Introduction, July 1, 1962, p. 1.

[18] Ibid., p. 2-5.

[19] Department of the Navy, Bureau of Supplies and Accounts, BUSANDA Instruction 441.2B, April 25, 1963, p. 2.

Equipage Category Numbered APLs are similar in format to the Equipment APLs but differ in purpose. The Equipage Category Numbered APL specifies the ship's actual allowance or requirements for shipboard equipage.[20] It is also used to list miscellaneous material requirements for mechanical and electrical systems. Normally, items on Equipage Category Numbered APLs are carried in operating spaces aboard ship rather than in the storerooms, although in certain instances storeroom requirements are designated. Equipage Category Numbered APLs are coded to indicate operating space requirements as distinguished from storeroom items.

In distinguishing between allowed onboard items and other items carried elsewhere in the supply system to support the equipment or component, the allowance preparing activities developing the APLs make use of the following codes:

1. Source Codes are codes which indicate the source for an item required for the maintenance, repair, or overhaul of an equipment. Specifically, these codes indicate whether the part is to be procured and carried in the supply system; not to be carried in the supply system but to be procured on demand; to be manufactured; to be obtained from salvage; to be assembled using component parts; not to be replaced due to impracticability of replacement; or, failure or

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[20] Ibid.

damage of part indicates a requirement for complete overhaul or scrapping of the assembly or equipment.

2. Maintenance Codes reflect the lowest maintenance echelon capable of installing an item in an equipment or of manufacturing, assembling, or testing an item prior to installation, that is, an overhaul activity, tender or repair ship, assigned vessel or squadron, or specialized repair facilities.
3. Recoverability Codes reflect the recoverability characteristics of items removed from equipments at time of maintenance, repair, or overhaul. Such items are designated as repairable, salvageable, or consumable (expendable).[21]

These Source, Maintenance, and Recoverability Codes guide the consumer activity or the ship in its replenishment, repair, maintenance, and material disposition actions.

The Stock Number Sequence List, Part III of the COSAL, is the supply management section of the allowance list.[22] Since it is the basis for supply actions, items in the Stock Number Sequence List are identified by the current Federal Stock Number or other identifying number from the APL. The first section deals with the authorized storeroom allowance quantities of repair parts and materials required to be aboard

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[21] Department of the Navy, COSAL: Introduction, July 1, 1962, pp. 1-2 and 2-7.

[22] Ibid., pp. 1-1, 2-11.

to support the equipment listed in Part I. Each line item specifies the stock number, the nomenclature, unit of issue and allowed quantity of the repair part, and the equipment supported. The second section is a consolidated list of operating space items derived from the Equipage Category Number APL. This second section serves as a guide in assisting ships' personnel in determining overall operating space requirements. Specific allowances for each operating space are determined from the individual APL.

The Stock Number Sequence Lists of mechanized allowance lists provided excellent tools for setting up inventory control procedures to use drawer-bin stowage facilities, as directed by the Chief of Naval Operations under the COSAL Program. Although the COSAL did not eliminate "caches" of repair parts in operating spaces for emergency use, it did require that stock record cards show all stowage locations.[23] Primarily the drawer-bin stowage with central location was recommended wherever practicable for the consolidated allowance requirements for an item of a given material cognizance. Bin-loading and bin-drawer stowage led to improved material readiness by providing effective use of stowage space, by allowing ready accessibility to material, and by permitting simplified inventory control.

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[23] Department of the Navy, Bureau of Ships, BUSHIPS Instruction 4441.65, December 4, 1957, Enclosure 1, p. 2.

Criteria for Authorized Quantities of Items within the COSAL

After a standard format was established for the COSAL, certain criteria had to be set up for use in deciding the quantities of items to be authorized in the shipboard allowance. The Allowance list can be effective only if it reflects fleet experience in the use of repair parts. Toward the accomplishment of this goal of an effective allowance list, the Chief of Naval Operations provided certain definite criteria for use in deciding the range (variety of items) and depth (quantity of an individual item) of a ship's allowance.[24] These criteria included the following requirements:

1. Material must be limited to items necessary to maintain essential equipment operable.
2. Allowed items must be within the capability of the ship's force to install or maintain.
3. Weight and cube of items must be considered in view of the ship's weight and space limitations.
4. Every contingent requirement cannot be met; therefore, "need" rather than "desire" must be the deciding factor.
5. Range must take precedence over depth.
6. Allowance lists will support wartime needs.

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[24] Department of the Navy, Bureau of Supplies and Accounts, Fleet Operations Division, "Conventional Allowance List Program vs. Stated CNO Objectives," unpublished report, 1961, p. 6.

Recent instructions provide for an effectiveness (filling of all shipboard demands) of 90 per cent for a period of 90 days for demand based items.[25] These demand items have a predicted usage of at least one unit in 90 days for all installations aboard. Whenever possible, the usage predictions are based on combat consumption rates. Those items that do not have a predicted usage of one in 90 days are considered insurance items. The occasional intermittent demands for these items do not warrant classification as regular stock; however, prudence requires that a nominal quantity for some of these items be stocked because of their essentiality coupled with the long lead time required for their purchase. The stock of insurance items is kept to a minimum depth and includes only those considered vital to the primary mission of the ship or to the safety or welfare of the ship's personnel. Even vital items are not to be stocked unless there has been an experienced replacement need for the item in the previous two years.

The current endurance figure of 90 days is based upon the fact that air resupply capability from the continental United States is available along with underway replenishment capability provided by underway replenishment ships. Air resupply for critical and urgent requirements can be effected from the continental United States by transferring the needed item to a Carrier Onboard Delivery (COD) aircraft for delivery

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[25]Department of the Navy, Office of the Chief of Naval Operations, OPNAV Instruction 4441.12, August 27, 1964, enclosure 1, p. 1.

to an aircraft carrier and further transferred, as necessary, to the requiring ship by heliocopter.

Applying the established criteria for determining a ship's allowance is not a simple or routine calculation. Since most of the Navy's ships are multi-mission weapon systems (for example, a destroyer has an anti-air warfare mission, anti-submarine warfare mission, electronic countermeasure mission, shore fire support mission, and surface and air search missions, as well as others), structuring the equipments in support of these missions is a complicated task. Calculation of the effect of equipment failures on the degradation of the ship's capability to carry out its various missions is complicated further if usage data is distorted by the possibility of improvising, borrowing, or "cannibalizing" less important equipments for the repair parts needed to repair more essential equipment.[26]

Several projects have been inaugurated in this area with the objective of establishing a basis for evaluating the relative military importance of a ship's equipments, components, and repair parts.[27] The specific purpose was to determine the military importance of equipments, components, and parts by relating their function to the accomplishment of assigned missions. This led to the development of military essentiality

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[26]Department of Defense, Supply Management Reference Book, September, 1964, p. 140.

[27]Auditor General [illegible] the Navy, Supply System Responsiveness to Fleet Requirements for Ships Assemblies and Repair Parts, (Short Title: Ships Parts Audit), Service-wide Audit Report No. I A16-63, June 26, 1964, p. 62.

codes, a numerical code reflecting the relationship of function to mission and offering the first realistic means of measuring Fleet material readiness. When the Chief of Naval Operations conducted trial programs using military essentiality codes with selected vessels of the Atlantic Fleet in 1961 and 1962, the experience showed that the program should be extended Fleet-wide. Efforts to include the codes in all COSALs became a formidable task, however, when it became apparent that Fleet personnel could not agree on the essentiality of a particular component or part to a specific mission. Moreover, much time and effort was required to develop and apply military essentiality codes to all standard Navy Stock List items.

To varying degrees, depending on the hull type and design of the ship, space can be another complicating factor. On a submarine the storage space may be critical, whereas in large hulls it may be a relatively insignificant factor if the load is kept within reasonable bounds. In any case, however, there has to be some limit or constraint on the storage volume which repair parts can consume. It may be stated in explicit terms of cubic feet or exist in only a vague, undefined assumption.

In addition to the space constraint, the cost factor makes developing a ship's allowance especially difficult. Expensive parts can not be prescribed in the depth that inexpensive items are. There are no clearly defined rules, but

an effective allowance list must be maintained within the allowance budget. The active fleet carries a shipboard inventory valued at approximately $150,000,000.[28] Such an investment must, of necessity, be based on the most careful calculations. Nor can deficiencies of vital items be permitted because available funds are tied up by high-cost, low-demand items.

Efforts to Keep the COSAL Responsive to Changes

Besides reflecting past experience and usage, an effective allowance list must be responsive to changes in shipboard equipments and changes in demand. Existing instructions provide that recommendations for changes in allowance quantities be directed by individual ships to the appropriate technical bureaus and allowance preparing activities via the type commander. Nevertheless, individual changes are frequently slow or completely lacking between overhauls. The COSAL is, however, subjected to a comprehensive maintenance revision at the time of each regularly scheduled overhaul.[29]

During a typical supply overhaul, a ship's Allowance List Equipment Index is revised in a thorough and efficient manner to reflect current equipment installations. The ship's inventory of repair parts is taken from the ship to a warehouse where it is identified, counted, repackaged and reproserved

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[28] Department of Defense, Supply Management Reference [illegible], p. 148.

[29] Department of the Navy, Bureau of Ships, BUSHIPS Instruction 4441.72A, August 15, 1960, p. 3.

with the physical inventory count recorded on electronic accounting machine cards. The physical inventory is compared to the allowance list by computer; shortages and excesses are computed; and requisitions, invoices, and updated stock record cards are provided as an output of the computer. On the basis of the information gained, material shortages are provided; excess material is offloaded; and the adjusted stocks of material are restowed aboard the ship. Upon completion of the supply overhaul, the ship's allowance list and corresponding stock should represent accurately the range and depth of items required to support the ship's new equipment configuration.

This procedure has been developed by the Navy's Supply Assistance Program in an effort to improve the technical supply readiness of U.S. Navy ships.[30] The need for such a program was generated by the increasing complexity of propulsion, missile and electronics systems in ships, requiring an increasing range of repair part support. For example, a guided missile destroyer may stock 25,000 different repair parts.

The Supply Operations Assistance Program is designed to guide and assist the ship's force in accomplishing the overhaul objectives to assure maximum repair part supply readiness upon rejoining the fleet. Approximately 300 ships, or a third of the active fleet, are overhauled under Supply Operations Assistance Programs annually. A total of about

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[30] Department of Defense, Supply Management Reference Book, September, 1964, pp. 146-150.

$50,000,000 of inventory is identified, counted, repackaged and preserved as necessary, and restored to use. Approximately $10,000,000 of inventory each year is found in excess to the needs of the ships carrying it; under this program excess inventory is redistributed to other ships or returned to the supply system. The use of computers in Supply Operations Assistance Programs with automatically prepunched requisitions, invoices, and ship stock record cards saves thousands of man-hours of labor formerly required for manual preparation of these documents in the task of updating the ship's COSAL.[31] The procedures set up by Supply Operations Assistance Programs have made a major contribution in eliminating excessive depth in unbalanced supplies and in permitting adjustment and flexibility within the COSAL to meet varied support concepts.

Deficiencies within the COSAL

The Coordinated Shipboard Allowance List answers the need for a standard, uniform document and represents significant progress over its predecessors. The objectives of the COSAL are based upon sound principles, and it will continue to be, at least in the near future, the basic stocking authority for shipboard inventories of repair parts. Since its initial development in 1957, emphasis has been exerted toward making it a completely responsive and effective allowance list. Considerable achievements toward this goal have been realized, [illegible] certain deficiencies remain.

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[31] Ibid., p. 148.

There are current and wide-spread complaints in both the Atlantic and Pacific Fleets that major shortages of repair parts exist aboard the ships. If the Chief of Naval Operations' directives require that ships carry allowed materials on board, how and why do these shortages exist?

The possible answers or reasons for these deficiencies are numerous. New equipments require new supporting parts, and the COSAL may not be kept up to date as it should be. The validation by ships of equipments to allowance lists is often inaccurate and late. The communication among the Fleet units, the bureaus, and supply demand control points is often weak and ineffective. The Supply Operations Assistance Program data accumulated during supply overhaul is not always utilized; nor is the Supply Demand Control Point data that is passed to Supply Operation Assistance Program teams always complete or on time. Funding may be inadequate to cover all allowance deficiencies. The support provided by allowance lists varies: some are based on wartime usage; others are very problematical. There is still no uniform program for the collection of usage data. Many of the data elements required to assure that ships are endurance loaded with balanced support are either not available or not used. COSALs fail to indicate for each shipboard equipment and allowed items their relative military worth. Nor is there at the present time a precise means of determining a ship's military readiness.

On the other hand, while many ships are reporting allowance deficiencies, excesses exist aboard others. Obviously true requirements based upon experience are not being reflected in the present allowance lists. The problem has become further complicated by the increase of modern , complex ships and equipments in recent years. To support fully the total fleet of approximately 800 ships, allowance lists contain about 1.5 million different items. Keeping these allowance lists continually current and effective is a tremendous undertaking. Only through the implementation of an improved data collection, analysis, and reporting system can the tools be provided for a more precise method of computing effective allowance lists. Current programs are seeking to provide these tools that will make this first echelon of supply capable of supporting a ship under any circumstances.

CHAPTER III

CURRENT DEVELOPMENTS TOWARD IMPROVING ALLOWANCE LISTS DECISIONS

In its effort to produce a continually effective and responsive allowance list, the Navy has recognized the necessity for improved techniques for making allowance decisions if it is to maintain a Fleet ready to perform its basic missions. The criteria and policies which determine the construction of shipboard allowance lists have an extensive influence on many other actions of the supply system at the shipboard, fleet commander, stock point, inventory control point, and managerial and technical bureau level. Allowance decisions have a direct or indirect impact on many functions, such as: provisioning, procurement, budgeting, transportation, fleet funding, investment levels, shipboard storage and record keeping. The decisions that govern the construction of the shipboard allowance lists also govern the volume and composition of the materials in the mobile logistic support forces (tender, repair and supply ships) and in the supply system stocks ashore, and to a great extent determine the effectiveness of the support these stocks provide.

Criticisms of the Present Allowance Requirements

Theoretically if a ship carries its full requirements as authorized in the COSAL, it should be sufficiently equipped to perform its combat mission for a stated length of time without external supply support. In practice this could not be true. There are no precise Navy-wide standards or indices for measuring Fleet material readiness. Various audit tests, reviews, and evaluations in this area have revealed that inventory deficiencies alone do not offer such a measure.[32] Aboard ships where requisitions for ships parts requirements had been outstanding for periods from 100 to 450 days, there was little or no evidence that material delivery delays interfered with the capability of the vessel to perform its mission. A major reason that the ships' capabilities were not being impared, however, was that shipboard personnel frequently improvised or borrowed parts from other equipment to substitute for deficient items. Audit reports have also revealed that in fiscal year 1963 ships undergoing Supply Operations Assistance Program inventory reviews were able to fill only about 50 per cent of their ships parts deficiencies, sometimes from the inability of the supply system to furnish the needed items but primarily because of shortages of operating funds.[33] Moreover, the Ships Parts Control Center does not have information on ships parts deficiencies on active Fleet vessels.

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[32] Auditor General of the Navy, Supply System Responsiveness to Fleet Requirements for Ships Assemblies and Repair, Service-wide Audit Report No. TA16-63, June 26, 1964, pp.61-62.

[33] Ibid., p. 61.

Although the information becomes available to type commanders at a Supply Operations Assistance Program, it does not remain current or accurate because ships do not report stock status data. Nor is such information ever available on all ships at any one given time.

Studies of technical secondary items and repair parts indicate that demands are concentrated in a relatively few items, and that the bulk of the items carried in shipboard inventory are used rarely or not at all. A study of cruisers and destroyers in the Atlantic Fleet demonstrated that 85% of the items carried were not used even once in an overhaul-to-overhaul period, and that only 4% of the total items were used as often as once a year.[34] For a given ship, about 70 to 90% of the parts that are demanded at all will be used in quantities of only one or two each. The bulk of the total demands are concentrated in the relatively few high-volume items. These high-demand items include such things as oil seals, vacuum tubes, valves, turbine blades, batteries, tires, spark plugs, gaskets, fanbelts, lamps, and indicators. The usage of such readily identified items can be predicted with reasonable assurance, but predicting the quantity to be used is a more difficult task. Even the most used technical items have erratic demand, lead-time and repair-cycle fluctuations,

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[34] Clifford J. Miller, Budget Examiner, Military Division, Bureau of the Budget, Memorandum to Mr. Ellis Veatch, Chief, Military Division, Bureau of the Budget (Subject: Material Management Programs in the Navy), March 6, 1964, p. 5.

and other problems. Obviously most shortages found in allowance deficiencies involve the fast-moving items, whereas a considerable amount of the excess inventory includes the slow-moving ones.

This vital decision on the quantities needed of hundreds of thousands of items greatly influences distribution of each item, that is, whether the item is to be included in the ship's allowance list and carried aboard or if it is to be carried in the wholesale supply system only. If the items are stocked in limited depth at one or two points in the supply system, the total all-time buy will tend to be in quantities of two or five. If such items are carried at each place they may be used, the total all-time buy may be 50 or more. Distribution influences the all-time buy (and the all-time disposal loss) by a factor of 10 or 20 to one. From a supply viewpoint, it is doubtful that the widespread stockage of slow movers produces improvements that are worth the great cost--especially when it is considered that the resources thus applied are not available for high-priority items. It is probable that the provision of rapid resupply on a regular basis would achieve better support than could be accomplished through wide range and depth of slow-moving items carried on the ship.[35]

This leads to consideration of another factor affecting quantities of items to be carried aboard ship: the amount of time necessary for a ship to receive supplies that are required

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[35] Ibid., p. 15.

but not carried aboard. Because of the uncertainties inherent in these frequently lengthy time periods, safety levels may often be placed higher than ordinarily necessary. If the ship must consider resupply times in terms of weeks or months, it will seek safety through maintaining a wide range of inventory. If resupply took only hours or days, the need for widespread stockage of the slow-moving or low-demand items could be minimized.

Factors Contributing to Errors in the Allowance Requirements

A recent analysis of parts usage for a particular class of items on a destroyer revealed the following information:[36]

	Items used	Items not used	Total
Items in COSAL	57	64	121
Items not in COSAL	64		
Total	121		

The double occurence of the number 64 was a coincidence, but the analysis is especially interesting in that just as many deficiencies in inventory exist as excesses. How and why can such deficiencies and excesses exist in a program as supposedly well planned as the COSAL?

As presently formulated, allowance lists are the results of thousands of judgments, made by hundreds of individuals. To aid in making these decisions, the Navy now has numerous reporting requirements and reporting procedures that relate to

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[36] Ibid.

the need for repair parts and the allocation of supplies afloat. Large amounts of uncoordinated data clog the system with item codings, reports, symbols, control patterns, and bits of information of all types that vary from place to place and by class of material. As a result, basic information concerning the usage or the demand items may fail to get through or may be incomplete or inaccurate.

Added to this complex confusion of reports is the lack of overall direction of inventory-control functions. Basic supply functions such as demand forecasting, requirements determination, record-keeping and distribution control are dispersed for given groups of items. Problems also arise in allowance decisions in the separation of supply functions from technical logistical functions, such as engineering, design, and maintenance. The technical complexity of the more advanced shipboard installations and systems today has served to magnify even further the need for improved decision making processes.

Standard Navy Maintenance and Material Management Project

Various techniques and procedures have been devised to assist in the intelligent management of supply support, but the most widespread and far-reaching attempt to date is the Standard Navy Maintenance and Material Management Project formally activated by the Chief of Naval Operations in January 1963. The overall goal of the Maintenance and Material Management Program (MMM) is to improve the measurable state of

material readiness of the Navy's operating forces through better management of the maintenance and material resources.

This Maintenance and Material Management project is working toward the time-phased implementation of a standard planned maintenance management system throughout the Navy and a related maintenance data collection system in support of maintenance and material management. These two objectives have been separated into Program Milestone Plans A and B which are to be developed and carried out simultaneously.

Milestone Plan A of the Maintenance and Material Management Program directs its efforts toward a fleetwide extension of a planned maintenance system with emphasis placed on the maximum practical maintenance at the lowest echelon (the ship).[37] A series of milestones must be accomplished to implement such a system. These major efforts must include initially the development of preventive maintenance documentation and the development of uniform standards of maintenance planning, control and recording. When completed, all the preventive maintenance documents for a ship will provide the basis for the installation of a standard shipboard maintenance management system. Finally, a system must be developed to control this

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[37] Department of the Navy, Office of the Chief of Naval Operations, OPNAV Instruction 4700.16A, August 1, 1963, pp. [illegible]

standard. The control system development consists of the following steps:

1. Revising new equipment or new system procurement specifications to provide adequate preventive maintenance documentation.
2. Including the evaluation of equipment maintenance requirements during fleet evaluation.
3. Installing a standard maintenance management system in new ship construction.
4. Controlling the preventive maintenance documentation throughout the operating forces.[38]

Under Program Milestone Plan B the basic aim in the establishment of a maintenance data collection system is to provide required information and statistics as a basis upon which maintenance managers can effectively and efficiently manage the Navy's maintenance and material resources. The Maintenance Data Collection System is designed to provide a uniform system for information collection, a central point for processing the collected data, and a dissemination procedure to satisfy the needs of both the technical bureaus and the operating forces.[39] The eventual Data Collection System should reflect the detailed study of existing data collection systems with the resultant elimination of redundant and unnecessary

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[38] Ibid., p. 5.

[39] Department of the Navy, Office of the Chief of Naval Operations, Navy Maintenance and Material Management Manual, October 1964, p. 1.

reporting and the consolidation of the best techniques into a single data collection and automated data processing system. It should contain the best balance of management versus technical data requirements.

The development effort of the Maintenance and Material Management Program has included the establishment of test installations of the maintenance control concept and data collection system at a Naval air station and aboard two aircraft carriers and two destroyer tenders.[40] These limited tests have proven the feasibility of the program, and the present plans call for implementation of the Data Collection System in all surface force activities by January 1966.

In support of the Standard Navy Maintenance and Material Management Program, automatic data processing installations will be greatly expanded in the fleet during the next year to increase the number of ships operating under mechanized inventory management systems. With an established base for the recording, accumulation, and processing of the data received from the shipboard level, the data can be utilized to adjust and revise:

1. Configurative data, indicating the numbers and types of systems and equipments installed in specific ships for use in computing allowances;

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[40] Department of Defense, Supply Management Reference Book, September 1964, p. 179.

2. Source, Maintenance, and Recoverability coding of repair parts and assemblies in support of designed maintenance policies; and
3. Replacement factors of repair parts and assemblies in support of maintenance policies established for echelons of maintenance to determine requirements at time of provisioning for allowances, mobile logistic support force loads, and system stock and for replenishment procurements.[41]

The data produced by the Standard Navy Maintenance and Material Management Program will be validated against the data contained in the files at the inventory control points, compared with system issue data, and included in the files as updating information wherever appropriate. Eventually the maintenance data collection and analysis program is intended to provide data taking and reporting from all ships. If it is not possible to install a data processing unit on destroyers or smaller ships, key punch equipment will be provided, and there will be data processing installations in closely related command organizations at flotilla level.[42]

By January 1966, the Navy Maintenance and Material Management Project Group plans to achieve an improved measurable stat of Fleet material readiness with a significant

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[41] Ibid.

[42] Captain R. R. Campbell, S.C., U.S.N., "Logistics Management in the Fleet," United States Naval Institute Proceedings, Vol. 89, No. 10 (October 1963), p. 88.

increase in the efficient management of maintenance and material resources. With the proper data base and the capability to handle it, supply support for the planned maintenance actions would be based on a schedule rather than simply on a demand history. For the afloat supply needs that still must be handled by a more general calculation, it should be possible to produce reliable usage data to make procurement and stockage calculations more accurate. Technical needs for maintainability could be served, and man-hours of technical effort per weapon system or equipment for technical analysis and personnel allocation could be indicated. Moreover, under this program as planned, it should be possible to use the system for evaluating the items that are put aboard ship in terms of their military essentiality.[43]

Although the Maintenance and Material Management Project is probably the most comprehensive program relating to material readiness under development at the present date, its complete implementation is still in the future. At the same time of its development there are many other techniques and procedures being developed toward improving fleet readiness. Some of these projects have been initiated as a part of the overall Maintenance and Material Management study, while others are separate programs that may or may not be incorporated later into the program.

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[43] Ibid., p. 89.

In amplification of the Maintenance and Material Management project, the Bureau of Supplies and Accounts was requested to assume the following responsibilities:

1. Take the lead in developing uniform supply systems responsive to maintenance and material supply management needs of the various command levels of the operating forces.
2. Study and design an integrated maintenance, supply, and accounting data processing system for shipboard application.
3. Study and develop Navy Supply System techniques and procedures for improving the utilization by Inventory Control Point and Fleet Material Support Office of reliability, parts replacement, and other information generated by the data collection system.[44]

Material Requirements Usage List

In response to the assignment of these responsibilities, the Bureau of Supplies and Accounts has made considerable progress in studying, developing, and testing supply support procedures that would be responsive to planned maintenance needs. Uniform automatic data processing systems have been developed for supply functions with data processing installations installed

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[44] Department of the Navy, Office of Chief of Naval Operations, Chief of Naval Operations Letter 1609P43 (Subject: Navy Supply Management System and Procedures in Support of Standard Navy Maintenance and Material Management Program), August 12, 1963, pp. 2-4.

and tested afloat. Systems and procedures are being established to enable the Fleet Material Support Office and the Inventory Control Points to evaluate the information collected by the Maintenance Data Collection System.

As a part of the development and service test phase of the study to insure uniform supply procedures, the Bureau of Supplies and Accounts has been conducting tests of a concept involving the use of a Material Requirements Usage List. This list was devised to serve four basic purposes:

1. It will record an advance planning estimate of material requirements for a specific work request.
2. It will provide the repair department with the latest stock status information on the advance material requirements.
3. It will serve as authorization for maintenance personnel to draw material from the supply department.
4. It will be utilized to collect timely usage and cost data.[45]

Tests of the Material Requirements Usage List concept aboard the USS SIERRA (AD-18) and the USS PIEDMONT (AD-17) and DESRONS 7, 21, and 32 have now been completed and are presently being evaluated for necessary modification and inclusion in the uniform supply system being developed for the forces afloat.

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[45] Department of the Navy, Bureau of Supplies and Accounts, Bureau of Ships, and Ships Parts Control Center, "Comments on The Audit Report No. IM16-63 and Action Taken and Planned in Relation to the Audit Findings," June 25, 1964, pp. 26-27.

Use of Replacement Factors

Implementation of Uniform Automatic Data Processing for Inventory Control Points under the Bureau of Supplies and Accounts direction includes programs aimed at standardizing and improving allowance list decisions. In these efforts Uniform Automatic Data Processing for Inventory Control Points has employed the Experience Demand Replacement Factors and the Mean Family Replacement Factors.

The Experienced Demand Replacement Factors concept uses accumulated data involving demand and population (total application for all components) of an item as a tool for making reliable predictions for the future need of the item, both in the initial provisioning of the ship and in the allowance list requirements. This concept incorporates a feedback system as actual demand materializes over time and thus gives a more accurate picture to provisioners than previous means of estimating demand.[46]

While the Experienced Demand Replacement Factors offer a reliable technique for estimating the demand for established stock list items, replacement factors for repair parts for new equipments continue to be based primarily on judgment. Toward the solution of this problem the Mean Family Replacement Factors concept is being tested and studied at Inventory Control

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[46] L. A. Minnaugh, Operations Research Analyst, Special Assistants for Advanced Logistics Research and Development, [illegible] 39: Experienced Demand Replacement Factors (EDRF) [illegible] Navy Ships Parts Control Center, Mechanicsburg, Pa., January 25, 1963, pp. 1-7.

Points. Under this concept factors are developed for "families" and "sub-families" of items. These factors are then applied in decisions on new items based on the usage data of similar [illegible] similar service under similar operating [illegible].[47]

Ships Capability Impaired for Lack of Parts Program

Another project aimed at improving logistic support procedures through usage data collection is the Ships Capability Impaired for Lack of Parts Program. This program reporting system, developed by the Fleet Material Supply Office at the Bureau of Supplies and Accounts' request, offers a means for rapid identification and continuous analysis of material deficiencies upon which corrective action can be initiated and future support decisions can be based.[48] After a trial experiment using the Ships Capability Impaired for Lack of Parts reporting procedures aboard a limited number of ships proved successful, the Chief of Naval Operations extended its application throughout the fleet in December 1963. Its use is restricted to a selected group of equipments considered to be

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[47] Minnaugh, L. S., Bernstein, G. B., and Hess, R. F., Application Development Division, Data Processing Field Assistant Group, Airand Report 42: Mean Family Replacement Factors (MFRF), U.S. Naval Supply Depot, Mechanicsburg, Pa., March [illegible], 1964, pp. 1-6.

[48] Department of the Navy, Fleet Material Support Office, FMSO Instruction 4408.1A, March 11, 1964, p. 1.

of the highest importance to overall fleet readiness.[49] The technique is employed primarily for the surface missile systems and is intended to permit rapid engineering review at the bureau level of maintenance problems. Through this process certain significant deficiencies can be pinpointed and allowance lists can be revised accordingly.

High Value Management Program

Just as the Ships Capability Impaired for Lack of Parts program is limited to a selected group of weapons systems of prime importance, the High Value Item Management Program is limited in scope also. . . .to that small group of items that represent the Navy's largest expenditure. Currently the High Value Management Program includes 2,400 items, but it is expected to expand to encompass the approximately 10,000 items that account for only one per cent of the total stock numbered items in the Navy supply system but for more than 40 per cent of the total Navy inventory investment.[50] The High Value Item Management Program is designed to apply precise, intensive management control over this small number of selected items. The objective of this specialized management attention is to achieve inventory economies without impairing combat readiness.

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[49] James A. Breit, Lieutenant Commander, Supply Corps, U.S. Navy, "SCIP Reports Aboard," Monthly Newsletter, Magazine of the U.S. Navy Supply Corps, Vol. XXVII, No. 1 (January [illegible], p. 10.

[50] Department of the Navy, Office of the Secretary, High Value Item Management Policy Manual, SECNAV Instruction [illegible], June 18, 1965, p. 1.

An integral and unique part of the program is the High Value Item Asset Control which is designed to provide the asset location records by activity and the transaction reporting of all issues and receipt of controlled items. Items are assigned to High Value Item Asset Control by inventory managers for world-wide asset control. Specialized requisitioning and material turn-in documentation procedures are used to ensure positive transaction reporting and a closed audit trail.[51]

Military Essentiality Through Readiness Indices Program

A program that offers a wider scope of application to insure operational readiness is the Military Essentiality Through Readiness Indices (METRI) Program, which is being developed by the staff of Clark, Cooper, Field, and Wohl, Inc. in cooperation with the Bureau of Supplies and Accounts. The METRI system is a means of expressing, in numerical form, the degree of capability of a military unit to perform its mission or missions. The underlying approach of the METRI technology is the construction of an engineering model which represents the force unit, or ship, in every possible depth and scope of operations. All elements of the force unit--both men and machines--are linked together to show their proper functional relationships in performing defined tasks. The model of the

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[51] Department of the Navy, Bureau of Supplies and Accounts, HIVAC: Special Procedures for High Value Item Control of G and J Material Control Code Items, NAVSANDA Publication 432, June 5, 1964, pp. 4-15.

ship relates individual parts to the functioning of the appropriate components, the functioning of the components to the functioning of equipment, the functioning of equipments, people and consumables to systems, until the functioning of the ship as an entity is described. Thus, by considering the functional interactions of the various elements, and by more groupings of parts or units, the functioning of the ship can be related to the most detailed part of the ship. The contribution of each basic element to the next highest system is expressed numerically as the difference between the readiness with and without the element. The evaluation of these relationships provide the basis for the METRI system to define and compute essentiality. The output is a readiness index of military capability measured in universally understood terms on a 0 to 1 scale.[52] As a measure of performance of equipment, the readiness index considers design characteristics, failure probabilities, military worth, and the necessary level of repair parts back-up.

The proposed METRI system is flexible in that the model can be limited in depth and scope to satisfy interim reporting requirements of significance to various levels of decision making. Yet it is versatile enough to go into complete detail

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[52] Department of the Navy, Bureau of Supplies and Accounts, METRI: A Measurement of Military Readiness, 1964, pp. [illegible]

for each individual unit or combinations of units or combinations of military forces.[53]

The METRI model is essentially an equation, in both graphic and mathematical form, that predicts the expected readiness of a ship based on the reliability of the parts making up the ship and their importance to the overall mission. This model, therefore, could be used not only to produce an allowance list but also to measure the expected readiness that could be achieved by any proposed allowance list. The application of the METRI technique in the formulation of an allowance list has been studied by creating several allowance lists for the USS Ellison DD-864 and simulating the ship's operations with each of these alternative lists aboard. Evaluations of the tests indicated that the METRI list, which explicitly considers reliability of spares in combination, their importance to the ship's mission, and their cost, provides much higher readiness for a given amount of dollars spent than any of the other lists analyzed.[54] However, the METRI program is still in the research and development phase, and there are no scheduled plans at present for applying its use throughout the Fleet.

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[53] Department of the Navy, Bureau of Supplies and Accounts, Office of Assistant Chief for Research and Development, USS Ellison (DD-864) Pilot Program Report, Final Report 63-1, December 1964, p. 2.

[54] Department of the Navy, Bureau of Supplies and Accounts, METRI Project Office, A Report on Evaluation of Alternative Allowance List Policies, July 1, 1964, p. 8.

The programs and procedures being developed toward the formulation of improved allowance decisions are almost as numerous as the criticisms of the present system. Each project has its merits, but some are limited in scope, and others are still far from being perfected or implemented into the Fleet supply system. But the problem of insuring material readiness for the Fleet can not wait for a perfect solution. There must be a best possible overall means for devising allowance requirements today.

CHAPTER IV

THE FUTURE BASIS FOR ALLOWANCE LIST DECISIONS

An allowance list can not realistically be expected to provide a ship with supply effectiveness of 100 per cent. Such a goal would not be practical since this would mean maintenance of uneconomical levels of inventories aboard ships in order to fill immediately every possible requirement. The ideal standard is something slightly less than 100 per cent, depending upon such factors as the nature of the item, the mission supported, the location of external supply, and the ability of the supply system to respond to erratic demands.

The Chief of Naval Operations has stated that shipboard allowance should provide an effectiveness (filling of demand on board for demand-based items) of 90 per cent for 90 days. In theory, the COSAL does this; in fact, it does not. When 50 per cent of the parts required on board are not included in the allowance list or carried on board, the allowance list is not fulfilling its prime objective of insuring fleet readiness.

Need for Improved Usage Data and Related Measurements

The COSAL itself is based on sound principles, and the overall criteria for authorizing shipboard allowances on combat consumption rates should produce effective and efficient allowance lists. However, as previously stated, allowance lists are the results of thousands of judgments made by hundreds of individuals. Numerous reporting procedures and methods have been devised to aid these individuals in their judgments, but the data available in the past for the provisioners and inventory managers has not provided the complete, accurate, and timely basis needed for sound allowance requirements decisions. Studies of the Fleet's supply support have indicated that the basis for making allowance decisions should be sufficiently comprehensive to allow for the following capabilities:

1. The Navy must be able to ascertain the contribution of parts, components, sub-systems and systems to specific missions, and the consequences of material shortages must be measurable in terms of degradation of performance.
2. Inventory managers must be able to identify areas requiring corrective action, including the range and depth of inventories aboard ship as well as delays in system processing and delivery times for items not carried aboard ship.

3. The degree of material readiness must be measurable in relation to funding or budget requirements. Budget presentations must correlate time, dollars, and readiness, and these correlations should be used to support fund requests.[55]

These needed capabilities are not new requirements. To varying extents they have existed since the need for repair parts aboard ship began. But the discrepancies within the allowance program have been magnified by the introduction of more complex and more expensive equipment aboard ships and by the increased requirement today for forces afloat to have the capability of operating independently of logistic support for extended periods of time.

Just as the problems and needs of the repair parts support system are not new, the answers are not really new or revolutionary. The COSAL has gone far in providing a standard, mechanized form for the allowance list and in doing the necessary detailed work of identifying items and parts of components. It establishes the framework for insuring the Fleet with outstanding material readiness. Before and after the promulgation of the COSAL, many attempts have been made to measure the military worth of individual parts required, to set up techniques for authorizing allowances within the constraints of space and cost, and to base authorizations on

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[55]Auditor General of the Navy, Supply System Responsiveness to Fleet Requirements for Ships Assemblies and Repair Parts, Service-wide Audit Report No. I A16-63, June 26, 1964, p. 64.

experienced usage or demand. For the most part, these attempts have not been related. Although the COSAL is intended to be a coordinated effort of the technical bureaus and supply management, primarily the efforts for improvement have been segments of other programs under the various bureaus and not related to the COSAL as a whole. The bureaus react to their respective problems as they occur without incorporating the solutions, where applicable, into the ship's allowance list. To be effective, allowance decisions must reflect the concentrated and coordinated effort of the technical bureaus, the Bureau of Supplies and Accounts, and the supply demand control points, as well as close teamwork between the shore establishments and the fleet.

A large collection of measurements and techniques results simply in an overwhelming jumble of numbers and codes unless there is some common systematic method used for analysis and interpretation. Heretofore, it has not been practical to consider simultaneously all the technical, statistical, and economical elements of the allowance list problem. The implementation of Uniform Automatic Data Processing, both ashore and afloat, has now removed these restrictions on how large a volume of data or how complex a program can be considered and managed in a purposeful way. Mathematics in combination with electronic calculating machines now make it possible and practical to introduce many more influencing factors than ever considered previously in the allowance decisions. Moreover,

these factors can be considered in relation to each other, and the COSAL can now become a truly coordinated document in every sense.

Allowance lists should provide for the best possible "mix" (range and depth) of repair parts aboard a ship. The possible mixes and combinations of mixes are infinite. The crux of the allowance list problem is to attain the right aggregate of items based on combat usage conditions and yet established within space and cost restraints. Then this allowance must be supported and continuously reviewed and revised to remain current under changing conditions.

An Integrated Tool for Improving Allowance Decisions

The answer to providing the best combination of repair parts lies in the development of the Navy Standard Maintenance and Material Management Program. Within this program exists the overall tool that can act as the unifying element under any conditions of change. Existing systems and techniques under present development can be incorporated into this overall program, and a concentrated effort could make the Maintenance and Material Management plan the Navy way.

Complete implementation of the Maintenance and Material Management program represents a tremendous undertaking. It will require time and the painstaking, cooperative efforts of the supply and technical bureaus and the inventory control points, as well as the type commanders and the shipboard

personnel. Through its establishment, however, the operating forces will ultimately be able to plan and control maintenance with such added effectiveness that the material and financial resources necessary to achieve operational readiness can be more accurately calculated, justified, and acquired.

The development of the Maintenance Data Collection System will provide a uniform method for the accumulation, recording, control, reporting, utilization and feedback of data and summarized information on the use of repair parts. This data, in turn, can have the capability to serve the material management at the various command levels, afloat and ashore.

Under the Maintenance Material Management concept, information involving maintenance and use of materials would originate at the shipboard level, go to a data bank for processing and from there to a common Maintenance Data Center. Reporting procedures will follow as simplified a form as possible with all unnecessary repetition and coding eliminated. Information provided through these uniform reports will be complete and accurate and kept up to date to reflect the most current usage and any changes in requirements. The reports will be standardized throughout the Navy and will be adaptable to machine processing.

Although the implementation of the Maintenance Data Collection System might cause a temporary increase in the amount of administrative paperwork aboard ships, eventually the paperwork load aboard ships would be reduced. This

reduction would occur through simplification or replacement of current maintenance-related reports and forms. Moreover, under the Maintenance Data Collection system queries regarding maintenance or material usage would no longer be directed to the ship but to the Collection Center.

From this Maintenance Data Collection Center the allowance-making activities will have available to them the most current data possible reflecting the actual demand and usage of repair parts aboard ships. On the basis of the Maintenance and Material Management item usage data, Uniform Automatic Data Processing for Inventory Control Points will be able to standardize the range and depth determinations of items to be carried in the COSAL.

In addition to providing more accurate, more complete, and more timely data, the information resulting from the Maintenance and Material Management program will include measurements for military essentiality of items carried on shipboard inventories. Such a measurement is necessary for allowance decisions to reflect an overall view of the relationship between item and mission. Replacement factors, high value control, Ships Capability Impaired for Lack of Parts, Material Requirements Usage List, and Military Essentiality Through Readiness Indices will all have an influence on the techniques used within the Maintenance and Material Management Program. These processes will most likely become related to the total program and be included in the unified reporting procedures, rather than remaining identified to separate programs.

Although the data provided through the Maintenance Data Collection system can not always reflect actual combat usage consumption, there exists in its electronic data processing system the capability to project the present usage factors into probable combat situations and to analyze and determine the needs under such conditions. Our present issue data is to an increasing extent on new components, tried only in peacetime experience, and does not provide valid criteria for stocking combat consumption requirements. Where excesses in allowances on insurance or slow turnover items might exist under peacetime conditions, these excesses might become necessities in wartime or in any extended operations. The deficiencies in allowances, while serious in peacetime, would become critical under combat conditions.

With its use of automatic data processing, the Maintenance and Material Management Program offers the first truly coordinated means for basing allowance lists decisions on thorough and comprehensive analyses of usage data and a uniform means for keeping these lists current under changing conditions. However, simply knowing what should be included in the allowance list is not sufficient to insure Fleet readiness if the ship does not have enough funds to acquire the authorized stock.

For Fleet purposes it would be far more effective to evaluate material readiness by combat essentiality standards of measurements, but under the present funding system the

commanding officer of each ship must evaluate his needs by available dollars.[56] Casualty reports show that about one fifth of the units in the Seventh Fleet have impaired capability due to lack of repair parts, and the indications are that this lack is the result of insufficient funds to provide the parts needed to maintain existing equipment. It is believed that one of the reasons for this insufficient funding has been the lack of authoritative and quantitative data upon which to base funding requests.[57]

Within the Maintenance and Material Management program lies the means to establish a Navy-wide system for the needed quantitative measurement of material operability. Based on such a measure, comparisons of the cost of units ineffective for lack of parts with the cost of repair parts inventories might offer the means of gaining recognition of the relative importance of repair parts in the overall Navy budget.[58] Without a uniform system for quantifying the material combat needs of the Fleet, there may continue to be difficulties in justifying the Navy's Operations and Maintenance Budget; and

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[56]Department of the Navy, Commander Cruiser-Destroyer Flotilla Nine, Letter FD9 100/bh-7000 to Secretary of the Navy (Subject: Adequacy of Financing Fleet Material Readiness), March 9, 1964, p. 3.

[57]Department of the Navy, Commander Seventh Fleet, Letter FF/7/EGC to Secretary of the Navy (Subject: Adequacy of Financing Fleet Material Readiness), April 4, 1964, p. 1-2.

[58]Lot Ensey, Vice Admiral, U.S. Navy, Deputy Chief of Naval Operations (Logistics), "A Discussion of Certain Aspects of an Approach to Measuring Material Readiness in the Fleet," March, 1964, p. 31.

without sufficient funds ships may continue to have impaired capabilities due to a lack of needed repair parts. Assignment of actual dollar value has not yet been incorporated into the Maintenance and Material Management program, but quite probably before the system is completely established, such a measure will be included.

Conclusion

The requirements for repair parts have changed considerably since the first spare parts were placed aboard naval vessels. This everchanging environment for repair parts has made constantly changing demands on the development of the allowance list. The Coordinated Shipboard Allowance List, as first established in 1956, has been tried, tested, and proved to be both strong and weak. The Navy's top management is aware of the need for an effective allowance list, and as a result of this awareness and concern the overall picture for the future of the COSAL has become an optimistic one. Once the Maintenance and Material Management program is fully implemented, as presently scheduled for 1966, and its usage data becomes available, management at sea and ashore will have the ability to measure conditions on a continuing basis and to identify those areas where additional effort and resources are required.

All available resources and efforts should be concentrated on further development and immediate implementation of the Maintenance and Material Management program. Research efforts should continue to be directed toward further refinement

of the Military Essentiality Through Readiness Indices technique and incorporation of this technique, as well as a quantitative measurement, within the Maintenance and Material Management program. A high degree of material readiness can be achieved through an orderly, well planned work program adequately supported by repair parts and materials. The Maintenance and Material Management plan is aimed at providing such a situation. Under these conditions the COSAL, based on the full knowledge of maintenance and repair resources and fully funded, can and will provide the Fleet with the necessary shipboard resources to insure a high state of material and combat readiness.

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